Chapter 1
Introduction

1-1. Purpose and Scope

This manual provides guidance for the design and layout of civil works pumping stations used for removal of interior drainage from areas protected by local flood protection works and for water supply. The discussion presented in this manual is general in nature. The development of detailed design criteria is presented in other manuals referenced herein. This manual is for the guidance of Corps of Engineers personnel engaged in the design of flood protection projects.

1-2. Applicability

This manual applies to all HQUSACE elements, major subordinate commands, districts, laboratories, and field operating activities having civil works responsibilities.

1-3. References

a. CFR, Section 208-10, Title 33

b. **ER 1110-2-109**
Hydroelectric Design Center

c. **ER 1110-2-401**
Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual For Projects and Separable Elements Managed by Project Sponsors

d. **ER 1165-2-131**
Local Cooperation Agreements for New Start Construction Projects

e. **EM 385-1-1**
Safety and Health Requirements Manual

f. **EM 1110-2-1413**
Hydrologic Analysis of Interior Areas

g. **EM 1110-2-1913**
Design and Construction of Levees

h. **EM 1110-2-3104**
Structural and Architectural Design of Pumping Stations

i. **EM 1110-2-3105**
Mechanical and Electrical Design of Pumping Stations

j. [1]**NFPA 10**
Standard for Portable Fire Extinguishers

k. [1]**NFPA 37**
Stationary Combustion Engines and Gas Turbines

l. [1]**NFPA 101**
Life Safety Code

1-4. Plates

Plates 1 through 12 in Appendix A show different types of pumping stations constructed by the Corps of Engineers. A short description of each pumping station is also provided.

1-5. General

a. Dependability. Pumping stations are one of the more vulnerable features of a flood protection project. The failure of a pumping station during a flood could result in considerable damage within the protected area. This would cause the loss of some or all of the benefits that justified construction of the project. Consequently, station dependability must be the primary consideration, during the design and pump selection process.

b. Economics. While the cost of the pumping station is generally but a small percentage of the cost of the entire project, this does not mean that the designer is to proceed without any consideration of cost. Because of the infrequent operation of the majority of local flood protection pumping stations, efficiency can be sacrificed to a certain extent in favor of equipment with a lower first cost. However, higher pump efficiencies can actually lower the installed horsepower requirements and reduce operating costs for large stations that have frequent usage. The extra costs to provide higher efficiency equipment should be studied on a life cycle cost basis over the project life. This economic study should consider both first cost and the cost of operation, maintenance, and replacement of equipment over the project life.

c. Refinements. The equipment selected must be rugged, reliable, and well suited for the required type of service. The pumping station structure should be sized to house and support the equipment. Refinements which make no realistic contribution to usability or dependability

[1]Available from National Fire Protection Association, P.O. Box 9146, Quincy, MA 02269.

should be strictly avoided. Architectural appearance will not be a governing criterion except in highly developed areas where concessions in regard to exterior treatment may be made as discussed in EM 1110-2-3104.

d. Large stations. In the design of some stations an unusual combination of conditions may be encountered which will require special treatment. This will frequently be the case for exceptionally large stations. However, the fundamental principles, criteria, and policies provided herein are applicable to all stations. Stations having a capacity of 30 cu m/sec (1,060 cu ft/sec) or larger will be engineered by the Hydroelectric Design Center (HDC) in accordance with ER 1110-2-109.

1-6. Local Cooperation

a. General. Project cooperation agreements (PCAs) are prepared by the project management office in accordance with ER 1165-2-131. Engineers responsible for the preliminary design and layout of the pumping facility should coordinate any special design features that may affect the local sponsor's costs with the project manager.

b. Maintenance and operation. A project's Operation and maintenance manual will outline the responsibilities of the project sponsor for the operation, maintenance, repair, replacement, and rehabilitaion (OMRR&R) of all project features. Instructions for the preparation of operation and maintenance manuals are provided in ER 1110-2-401. Development of the pumping station feature of the manual is contained in EM 1110-2-3105.